14857/US Hz/hr

CLAIMS (as originally filed and published)

1. A process for object detection, with the steps:
   - enlarged optical imaging of at least one resting or moving object (10) on a structured mask (20) with at least one segment (30) which is adapted for transmitting light from a flat section (80), in which the object (10) is located at least partially or temporarily and which has a characteristic dimension smaller than the dimension of the object (10) or its movement path, to a detector unit (123),
   - detection of the quantity of light transmitted by the structured mask (20) and generation of a detector signal which has a predetermined relationship with the quantity of light, and
   - evaluation of the detector signal in regard to the presence of the object (10), its position, its shape, and/or the temporal change of the position.

2. The process according to claim 1, wherein the object detection is performed on synthetic or biological particles (10) in a microchannel of a fluidic microsystem in which the particle is subjected to hydrodynamic, acoustic, magnetic, and/or electrical forces.

3. The process according to claim 2, wherein the mask (20) is positioned in relation to the microsystem in such a way that light is transmitted by the mask from a section (80) in which the particle (10) is to be positioned or moved.

4. The process according to claim 2, wherein the mask (20) is positioned in relation to the microsystem in such a way that light is transmitted by the mask from

a section (80) into which the particle (10) is not to enter.

5. The process according to one of the preceding claims, wherein
   - to detect the presence of a resting particle (10), it is detected whether the detector signal (D1) has a predetermined, unchanging amplitude,
   - to detect the presence of a moving particle (10) at a specific position, it is determined whether the detector signal has a predetermined time characteristic,
   - to detect the frequency and speed of particles (10), maxima of the detector signal are evaluated in regard to their width and their interval, and/or
   - to count particles (10), the maxima of the detector signal are counted.

6. The process according to claim 5, wherein determination of the direction of the particle movement and/or size-dependent particle counting is performed.

7. The process according to one of the preceding claims, wherein the amplitude of the detector signal and/or the variability of the detector signal are evaluated.

8. The process according to one of the preceding claims 2 to 7, wherein the particle (10) is fixed or moved with a trapping laser.

9. The process according to claim 8, wherein the particle (10) is brought into contact with a modification layer (55), a cell (56), or receptors (57) in the microsystem with the trapping laser (60) and, during the evaluation of the detector signal in regard to the movement characteristics of the particle (10), parameters are determined which are characteristic for the

interaction of the particle (10) with the modification layer (55), the cell (56), or the receptors (57).

10. A device for object detection, which comprises:
- an optical imaging unit for enlarged imaging of at least one resting or moving object (10) on a structured mask (20), having at least one light transmitting segment (30) which is set up for the purpose of transmitting light from a flat section (80), in which the object (10) is located at least partially or temporarily and which has a characteristic dimension smaller than the dimension of the object (10) or its movement path, to a detector unit (123),
- a detector unit (123) ~~for~~ detecting the quantity of light transmitted by the structured mask (20) and for forming a detector signal which has a predetermined relationship with the quantity of light, and
- an evaluation unit for evaluation of the detector signal in regard to the presence of the object (10), its position, its shape, and/or the temporal change of the position.

11. The device according to claim 10, wherein the optical imaging unit is part of a microscope.

12. The device according to claim 11, wherein the mask (20) is positioned in the beam path of the microscope.

13. The device according to one of the claims 10 to 12, wherein the mask (20) is a transmission screen with at least one transparent segment (30).

14. The device according to claim 13, wherein multiple segments are provided which are positioned two-dimensionally in the plane of the mask.

15. The device according to claim 13 or 14, wherein cross-shaped segments, frame-shaped segments, and/or straight or curved strip-shaped segments are provided.

16. The device according to one of the claims 10 to 15, wherein the detector unit (123) is set up for integrated detection of the partial image of the object (10) or its movement path transmitted or reflected by the mask (20).

17. The device according to one of the claims 10 to 16, which is set up for object detection of synthetic or natural particles (10) in a fluidic microsystem.

18. The device according to claim 17, wherein the particles (10) in the microsystem are subjected to hydrodynamic, acoustic, magnetic, and/or electrical forces.

19. The device according to claim 17 or 18, wherein a trapping laser arrangement (60, 160) is provided for manipulation of the particles (10) in the microsystem.

20. The device according to one of the claims 10 to 19, wherein the segment (30) has a characteristic dimension which is smaller than the object (10) or its movement path or is smaller than the image of the object (10) or its movement path.

21. The use of a process or device according to one of the preceding claims for
   - dielectric single particle spectroscopy in fluidic microsystems,
   - measurement of electromagnetic forces in microelectrode arrangements,
   - measurement of optical forces in trapping lasers,
   - detection of the function of microelectrodes in microsystems,

- detection of particle positions and/or movements, particle numbers, and/or particle interactions, and/or
- measurement of particle rotations which are induced by rotating electrical fields.